Stated Meeting, June 20.

Present, twenty-seven members.

Dr. FRANKLIN BACHE, Vice-President, in the Chair.

Letters were received and read:—

From Richard Owen, dated London, 18th March, 1845, acknowledging the receipt of notice of his election as a member of this Society:—

From the Geological Society of London, dated May 1st, 1845, acknowledging the receipt of a donation from the Society:—

From the Regents of the University of New York, dated Albany, 6th June, 1845, acknowledging the receipt of donations from the Society:—

From the New York Historical Society, dated New York, June 1845, acknowledging the receipt of the Proceedings of this Society:—

From the First Class of the Royal Society of Sciences of Holland, dated Amsterdam, 22d March, 1843, acknowledging the receipt of the Transactions of this Society, and announcing a donation:—

From the same Society, dated Amsterdam, 31st March, 1844, acknowledging the receipt of Transactions and Proceedings of this Society, and announcing a donation: and,—

From Lieut. Charles Wilkes, U. S. N., dated Philadelphia, 23d May, 1845, announcing a donation to the Society.

Mr. Kane announced that a letter had been received by Dr. Dunglison, from Prof. Van Raumer, acknowledging the receipt of notice of his election. Dr. D.'s sickness prevented him from reading it to the Society.

The following donations were announced:—

FOR THE LIBRARY.

The Journal of the Royal Geographical Society of London. Vol. XIII. Part II. 1844. 8vo. Vol. XIV. Part II. 1844. 8vo.—*From the Society.*

Bulletin de la Société de Géographiè. Troisième Série. Tome I. Paris, 1844. 8vo.—*From the Society.*

Nieuwe Verhandelingen der Eerste Klasse van het Koninklijk-Nederlandsche Instituut van Wetenschappen, Letterkunde en Schoonekunsten te Amsterdam. Tiende Deel. In Three Parts. Amsterdam, 1844. 4to.—*From the Royal Netherlands Institute.*

Het Instituut, of Verslagen en Mededeelingen, uitgegevin door de Vier Klassen van het Koninklijk-Nederlandsche Instituut van Wetenschappen, Letterkunde en Schoonekunsten. Over den jare, 1841, 4 numbers: over den jare, 1842, 4 numbers: over den jare, 1843, 4 numbers: and Nos. 1 and 2 of 1844. 8vo.—*From the same.*

The African Repository and Colonial Journal. Vol. XXI. June, 1845. No. 6. 8vo.—*From the American Colonization Society.*

Introductory Address of the Hon. R. J. Walker, delivered before the National Institute, at its April Meeting, 1844. Washington, 1845. 8vo.—*From the Institute.*

The Twenty-ninth Report of the Directors of the American Asylum, at Hartford, for the Education and Instruction of the Deaf and Dumb. Hartford, 1845. 8vo.—*From the Directors.*

Journal of the Franklin Institute of the State of Pennsylvania. Third Series. Vol. IX. June, 1845. No. 6. 8vo.—*From Dr. Patterson.*

Narrative of the United States Exploring Expedition, during the Years 1838, 1839, 1840, 1841, 1842. By Charles Wilkes, U. S. N., Commander of the Expedition, Member of the American Philosophical Society, &c. In Five Volumes, and an Atlas. Philadelphia. Lea & Blanchard, 1845. 4to.—*From the Author.*

Ornithological Biography, or an Account of the Habits of the Birds of the United States of America; accompanied by Descriptions of the Objects represented in the Work, entitled "Birds of America." By John James Audubon, F.R.SS. L. and E., &c. &c. Vol. IV. Edinburgh, 1838. 8vo.—*From the Author.*

The Electrical Magazine. Conducted by Mr. Charles V. Walker. Vol. I. No. 8. April, 1845. London. 8vo.—*From the Editor.*

The Zoologist: a Popular Monthly Magazine of Natural History.

Nos. 27 and 28. March, April, 1845. 8vo.—*From Edward Newman, Esq., Editor.*

The Phytologist: a Botanical Journal. No. XLVII. April, 1845. London. 8vo.—*From the same.*

On the Genus Sigillaria: Contributions towards establishing the General Characters of the Fossil Plants of the Genus Sigillaria. By William King, Esq. From the Edinburgh New Philosophical Journal, for January, 1844. 8vo.—*From the Author.*

Discurso dirigido ao Instituto Historico e Geografico do Brasil pelo seu Socio Correspondente Antonio Ladislau Monteiro Baena. Maranhão, Anno, 1844. 8vo.—*From the Author.*

Report of Experiments on Gunpowder, made at Washington Arsenal in 1843 and 1844. By Captain Alfred Mordecai, of the Ordnance Department. Washington, 1845. 8vo.—*From Major Hartman Bache.*

Études sur les Échinides, par M. Charles des Moulins. Première Partie. Études Générales, renfermant Trois Mémoires. Bordeaux, 1835, 1837. 8vo.—*From Isaac Lea, Esq.*

A Catalogue of the Generic and Sub-Generic Types of the Class Aves—Birds. Newcastle (England), 1840. 8vo.—*From the same.*

Report of the Natural History Society of the Counties of Northumberland, Durham, and Newcastle upon Tyne, for the Year ending August 1, 1833. 8vo.—*From the same.*

The Medical News and Library. Vol. III. June, 1845. No. 30. 8vo.—*From Messrs. Lea & Blanchard.*

Interference of the Executive in the Affairs of Rhode Island. 28th Congress, 1st Session, House of Representatives, No. 546.—*From Joseph R. Ingersoll, Esq.*

Message of the President of the United States to the Two Houses of Congress, at the Commencement of the Second Session of the 28th Congress, Dec. 3, 1844.—*From the same.*

Annual Report of the Commissioner of Patents, for the Year 1844. House of Representatives, No. 78.—*From the same.*

Commerce and Trade: Letter from the Secretary of State, transmitting Returns of the Consuls and Commercial Agents of the United States, at the several Ports abroad, containing Information in regard to the Amount and Description of Commerce and Trade between the United States and Foreign Countries, &c. March 3, 1845.—*From the same.*

Map of Texas and the Country adjacent. Compiled, from the best authorities for the State Department, under the direction of Col. J. J. Abert, by W. H. Emory. War Department, 1844.—*From the same.*

Coast Survey: an Article from the Biblical Repertory and Princeton Review, for April, 1845.—*From Professor Henry.*

ADDITIONS TO THE LIBRARY BY PURCHASE.

Astronomische Nachrichten. Nos. 531 to 537, inclusive. April 1, to May 24, 1845. 4to.

Niles' National Register. From Sept. 1843, to March, 1844. Vol. 65. From March, 1844, to Sept. 1844. Vol. 66. From Sept. 1844, to March, 1845. Vol. 67. Folio.

Dr. Horner read an obituary notice of Dr. Wm. S. Jacobs, lately a member of this Society.

On motion, Mr. Kane was excused from the duty of preparing an obituary notice of the late Judge Baldwin.

Mr. Ord announced the death of Prof. J. Gummere, on 31st May, 1845, in the 62d year of his age.

On motion of Mr. Kane, Dr. Patterson was appointed to prepare an obituary notice of Prof. Gummere.

Dr. Patterson exhibited to the Society a curious coin, found in a marl pit in New Jersey, twenty feet below the surface; which is a counterfeit of a Belgian coin of 1648.

Dr. Patterson also exhibited a mass of nails melted together at the fire in Pittsburg, presenting a series of united tubes.

Prof. Henry stated that he had received a similar mass from the New York fire, and found that the action of the fire had changed the nails to a certain depth, leaving a core unchanged, which had afterwards fallen or been drawn out, leaving the hollow tubes.

Prof. Henry, of Princeton, made a verbal communication of a series of experiments made by himself and Prof. Alexander relative to the spots on the sun.

His attention was directed to this subject, by an article in the September number of the Annales de Chimie, by M. Gautier, upon the influence of the spots on the sun on terrestrial temperature. It is well known that Sir William Herschel entertained the idea, that the

appearance of solar spots was connected with a more copious emission of heat, and that the seasons during which they were most abundant, were most fruitful in vegetable productions; and, pursuing this idea, he was led to trace an analogy between the price of corn and the number of solar spots, during several successive periods. The result of this investigation, so far as it was extended, seemed to favour the views of this distinguished philosopher. A mode of investigation of this kind, however, is not susceptible of any great degree of accuracy; the price of corn is subject to so many other causes of variation besides that of solar temperature, that little reliance can be placed on it.

M. Gautier has attempted to investigate the influence of the solar spots on terrestrial temperature, by comparing the temperature of several places on the earth's surface, during the years in which the spots were most abundant, with those in which the smallest number were perceptible. From all the observations collected, it seems to be indicated, that during the years in which the spots were the greatest in number, the heat has been a trifle less; but the results are far from being sufficiently definite to settle the question: and M. Gautier remarks, that a greater number of years of observation at a greater number of stations, will be necessary to establish a permanent connexion between these phenomena.

The idea occurred to Prof. Henry, that much interesting information relative to the sun might be derived from the application of a thermo-electric apparatus to a picture of the solar disc, produced by a telescope, on a screen, in a dark room. This idea was communicated to Prof. Alexander, who readily joined in the plan for reducing it to practice. It was agreed, that they should first attempt to settle the question of the relative heat of the spots as compared with the surrounding luminous portions of the sun's disc. The first experiments were made on the 4th of January, 1845. Mr. Alexander had observed, a few days previous, a very large spot, more than 10,000 miles in diameter, near the middle of the disc. To produce the image of this spot, a telescope of four inches aperture, and four and a half feet focus, was placed in the window of a dark room, with a screen behind it, on which the image of the spot was received. The instrument was placed behind the screen, with the end slightly projecting through a hole made for the purpose, and a small motion of the telescope was sufficient to throw the image of the spot off or on the end of the pile. The spot was very clearly defined, and might have been

readily daguerreotyped, had the telescope been furnished with an equatorial movement. The form of the penumbra of the spot, as it appeared on the screen, was that of an irregular oblong, about two inches in one direction, and an inch and a half in the other. The dark central spot within the penumbra was nearly square, of about three-fourths of an inch on the side, and a little larger than the end of the thermo-pile.

The method of observation consisted in first placing, for example, a portion of the picture of the luminous surface of the sun in connexion with the face of the pile, and after noting the indication of the needle of the galvanometer, the telescope was then slightly moved, so as to place the dark part of the spot directly on the face of the pile, the indication of the needle being again noted. In the next set of experiments the order was reversed; the picture of the spot at the beginning of the experiment was placed in connexion with the pile, and afterward a new part of the luminous portion of the disc was made to occupy the same place.

The thermo-electrical apparatus used in these experiments, was made by Ruhmkorff, of Paris; and in order to render the galvanometer more sensitive, two bar magnets, arranged in the form of the legs of a pair of dividers, were placed with the opening downwards, in a vertical plane, above the needle, so that, by increasing or diminishing the angle, the directive power of the needle could be increased or diminished, and, consequently, the sensibility of the instrument could be varied, and the zero point changed at pleasure.

In the present experiments, in order to mark more definitely the difference in temperature, after the needle had been deflected by the heat of the sun, the magnetic bars above mentioned were so arranged, as to repel it back to near the zero point, so that it might, in this position, receive the maximum effect of any variation in the electrical current.

Twelve sets of observations were made on the first day, all of which, except one, gave the same indication, namely, that *the spot emitted less heat than the surrounding parts of the luminous disc.* The following is a copy of the record made at the time of the observations. The degrees are those marked on the card of the galvanometer, and are of course arbitrary.

Spot, $3°\frac{1}{4}$.	Sun, $5°\frac{1}{4}$.
Sun, $4°\frac{1}{2}$.	Spot, $4°$.

Sun, 3°.	Spot, 4°½.
Spot, 1°¾.	Sun, 5°.
Spot, 2°.	Sun, 4°½.
Sun, 3°.	Spot, 3°¾.
Sun, 2°½.	Sun, 2°.
Spot, 2°.	Spot, 3°¼.*
Spot, 2°.	Spot, 0°¾.
Sun, 2°¼.	Sun, 2°½.
Spot, 4°¾.	Sun, 1°¼.
Sun, 5°.	Spot, 0°.

The change in the temperature during the intervals of observation, is due to the variations in the temperature of the room differently affecting the two extremities of the pile.

In consequence of cloudy weather, another set of observations were not obtained until the 10th of January, and at this time the spot had very much changed its appearance; the penumbra, while it retained its dimensions in one direction, was much narrowed in the other, and the dark part was separated into two small ones; also the sky was not perfectly clear, and therefore the results were not as satisfactory as those of the previous observations; the indications were, however, the same as in the other sets, exhibiting a less degree of heat from the spots.

Cloudy weather prevented other observations on the heat of different parts of the sun, particularly a comparison between the temperature of the centre and the circumference of the disc, which would have an important bearing on the question of an atmosphere of the sun. The observations will be continued, and any results of interest which may be obtained, will be communicated to the Society.

Professor Henry also gave an account of some observations he had made on capillarity, in addition to those he had before communicated to the Society on the same subject.

In 1839, he presented the results of some experiments on the permeability of lead to mercury; and subsequent observation had led him to believe that the same property was possessed by other metals in reference to each other. His first attempt to verify this conjecture

* At this observation a slight cloud probably passed over the sun's disc.

was made with the assistance of Dr. Patterson, at the United States Mint. For this purpose, a small globule of gold was placed on a plate of sheet iron, and submitted to the heat of an assaying furnace; but the experiment was unsuccessful; for, although the gold was heated much above its melting point, it exhibited no signs of sinking into the pores of the iron. The idea afterward suggested itself, that a different result would have been obtained had the two metals been made to adhere previous to heating, so that no oxide could have been formed between the surfaces. In accordance with this view, Prof. H. inquired of Mr. Cornelius, of Philadelphia, if, in the course of his experience in working silver-plated copper, in his extensive manufactory of lamps, he had ever observed the silver to disappear from the copper when the metal was heated. The answer was, that the silver always disappears when the plate is heated above a certain temperature, leaving a surface of copper exposed; and that it was generally believed by the workmen, that the silver evaporates at this temperature.

Professor H. suggested that the silver, instead of evaporating, merely sunk into the pores of the copper, and that by carefully removing the surface of the latter by the action of an acid, the silver would reappear. To verify this by experiment, Mr. Cornelius heated one end of a piece of thick plated copper to nearly the melting point of the metal; the silver at this end disappeared, and when the metal was cleaned by a solution of dilute sulphuric acid, the end which had been heated presented a uniform surface of copper, whilst the other end exhibited its proper coating of silver. The unsilvered end of the plate was next placed, for a few minutes, in a solution of muriate of zinc, by which the exterior surface of copper was removed, and the surface of silver was again exposed. This method of recovering the silver before the process of plating silver by galvanism came into use, would have been of much value to manufacturers of plated ware, since it often happened that valuable articles were spoiled, in the process of soldering, by heating them to the degree at which silver disappears.

It is well known to the jeweller, that articles of copper, plated with gold, lose their brilliancy after a time, and that this can be restored by boiling them in ammonia; this effect is probably produced by the ammonia acting on the copper, and dissolving off its surface, so as to expose the gold, which, by diffusion, has entered into the copper.

A slow diffusion of one metal through another probably takes place

in cases of alloys. Silver coins, after having lain long in the earth, have been found covered with a salt of copper. This may be explained by supposing that the alloy of copper, at the surface of the coin, enters into combination with the carbonic acid of the soil, and being thus removed, its place is supplied by a diffusion from within; and in this way it is not improbable that a considerable portion of the alloy may be exhausted in the process of time, and the purity of the coin be considerably increased.

Perhaps, also, the phenomenon of what is called *segregation*, or the formation of nodules of flint in masses of carbonated lime, and of indurated marl in beds of clay, may be explained on the same principle. In breaking up these masses, it is almost always observed, that a piece of shell or some extraneous matter occupies the middle, and probably formed the nucleus, around which the matter was accumulated by attraction. The difficulty consists in explaining how the attraction of cohesion, which becomes insensible at sensible distances, should produce this effect. To explain this, let us suppose two substances uniformly diffused through each other by a slight mutual attraction, as in the case of a lump of sugar dissolved in a large quantity of water, every particle of the water will attract to itself its proportion of the sugar, and the whole will be in a state of equilibrium. If the diffusion at its commencement had been assisted by heat, and this cause of the separation of the homogeneous particles no longer existed, the diffusion might be one of unstable equilibrium; and the slightest extraneous force, such as the attraction of a minute piece of shell, might serve to disturb the quiescence, and draw to itself the diffused particles which were immediately contiguous to it. This would leave a vacuum of the atoms around the attracting mass: for example, as in the case of the sugar, there would be a portion of the water around the nucleus deprived of the sugar; this portion of the water would attract its portion of sugar from the layer without, and into this layer the sugar from the layer next without would be diffused, and so on until, through all the water, the remaining sugar would be uniformly diffused. The process would continue to be repeated, by the nucleus again attracting a portion of the sugar from the water immediately around it, and so on until a considerable accumulation would be formed around the foreign substance.

We can in this way conceive of the manner by which the molecular action, which is insensible at perceptible distances, may produce results which would appear to be the effect of attraction acting at a distance.

Professor Henry also made a communication relative to a simple method of protecting from lightning, buildings covered with metallic roofs.

On the principle of electrical induction, houses thus covered are evidently more liable to be struck than those furnished either with shingle or tile. Fortunately, however, they admit of very simple means of perfect protection. It is evident, from well established principles of electrical action, that if the outside of a house were encased entirely in a coating of metal, the most violent discharge which might fall upon it from the clouds would pass silently to the earth without damaging the house, or endangering the inmates. It is also evident, that if the house be merely covered with a roof of metal, without projecting chimneys, and this roof were put in metallic connexion with the ground, the building would be perfectly protected. To make a protection, therefore, of this kind, the Professor advises that the metallic roof be placed in connexion with the ground, by means of the tin or copper gutters which serve to lead the water from the roof to the earth. For this purpose, it is sufficient to solder to the lower end of the gutter a riband of sheet copper, two or three inches wide, surrounding it with charcoal, and continuing it out from the house until it terminates in moist ground. The upper ends of these gutters are generally soldered to the roof; but if they are not in metallic contact, the two should be joined by a slip of sheet copper. The only part of the house unprotected by this arrangement will be the chimneys; and in order to secure these, it will only be necessary to erect a short rod against the chimney, soldered at its lower end to the metal of the roof, and extending fifteen or twenty inches above the top of the flue.

Considerable discussion in late years has taken place in reference to the transmission of electricity along a conductor; whether it passes through the whole capacity of the rod, or is principally confined to the surface. From a series of experiments presented to the American Philosophical Society, by Professor Henry, on this subject, it appears that the electrical discharge passes, or tends to pass, principally at the surface; and as an ordinary sized house is commonly furnished with from two to four perpendicular gutters (generally two in front and two in the rear), the surface of these will be sufficient to conduct, silently, the most violent discharge which may fall from the clouds.

Professor Henry also stated, that he had lately examined a house

struck by lightning, which exhibited some effects of an interesting kind. The lightning struck the top of the chimney, passed down the interior of the flue to a point opposite a mass of iron placed on the floor of the garret, where it pierced the chimney; thence it passed explosively, breaking the plaster, into a bedroom below, where it came in contact with a copper bell-wire, and passed along this horizontally and silently for about six feet; thence it leaped explosively through the air a distance of about ten feet, through a dormer window, breaking the sash, and scattering the fragments across the street. It was evidently attracted to this point by the upper end of a perpendicular gutter, which was near the window. It passed silently down the gutter, exhibiting scarcely any mark of its passage until it arrived at the termination, about a foot from the ground. Here again an explosion appeared to have taken place, since the windows of the cellar were broken. A bed, in which a man was sleeping at the time, was situated against the wall, immediately under the bell-wire; and although his body was parallel to the wire, and not distant from it more than four feet, he was not only uninjured, but not sensibly affected. The size of the hole in the chimney, and the fact that the lightning passed along the copper wire without melting it, show that the discharge was a small one, and yet the mechanical effects, in breaking the plaster, and projecting the window frame across the street, were astonishingly great.

These effects the Professor attributes to a sudden repulsive energy, or expansive force developed in the air along the path of the discharge. Indeed, he conceives that most of the mechanical effects which are often witnessed in cases of buildings struck by lightning, may be referred to the same cause. In the case of a house struck within a few miles of Princeton, the discharge entered the chimney, burst open the flue, and passed along the *cockloft* to the other end of the house; and such was the explosive force in this confined space, that nearly the whole roof was blown off. This effect was, in all probability, due to the same cause which suddenly expands the air in the experiment with Kinnersly's electrical air thermometer.

Dr. Patterson stated, that Mr. Jefferson was of the opinion that metal roofs protected buildings, not from being struck, but from the danger of the stroke; the contrary opinion is generally held, but Prof. Henry's experiments show that Mr. Jefferson was correct. Dr. P. saw the lightning strike a row of dormitories with metal roofs, at the University of Virginia:

the flash was very severe, but produced no evil effect; the lightning had spread itself over the surface, and left its mark at each interruption of the conductor, but did no damage. It was said at the University, that the Rotunda had been frequently struck without injury.

Mr. Fraley, on behalf of the Committee appointed to adjust the claim of Mr. Wm. D. Lewis, reported that the proposed arrangement had been made, and the bonds of the Society delivered and cancelled.

Dr. Patterson presented to the Society an application from the chairman of a joint committee of the City Councils and the County Board, for the purchase of the Society's property, which was referred to a special Committee, consisting of Dr. Patterson, Mr. Fraley, and Mr. Coles, to report thereon.

On motion of Dr. Horner, the head of the Mastodon, belonging to the Society, was placed in the custody of the University of Pennsylvania, to be put in the Wistar Museum.

Stated Meeting, July 18.

Present, fourteen members.

Dr. FRANKLIN BACHE, Vice-President, in the Chair.

Letters were received and read:—

From the Linnæan Society, dated London, 18th April, 1845, acknowledging the receipt of donations from this Society: and,—

From A. D. Bache, dated Washington, 24th June, 1845, announcing a donation from the Treasury Department of the United States.

The following donations were announced:—

FOR THE LIBRARY.

Flora Batava, ou Figures et Descriptions de Plantes Belgiques. Par Jan Kops and J. E. van der Trappen. Livraisons No. 134, 135, 136. 4to. Title and Indexes of Vol. VIII.—*From H. M. the King of the Netherlands.*